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# PATENT ABSTRACTS OF JAPAN

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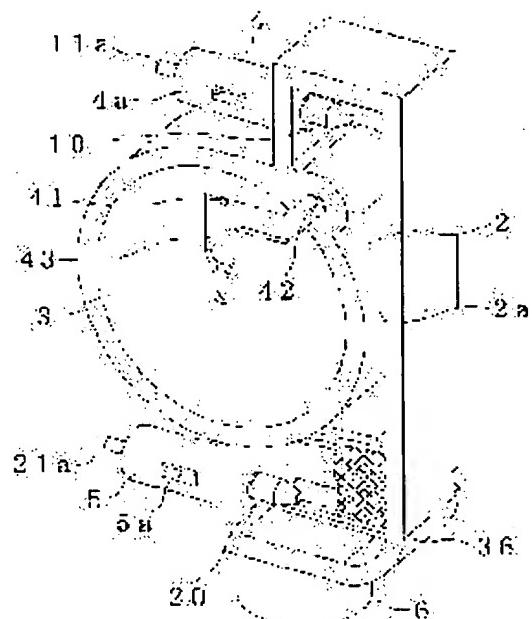
(72)Inventor : MIYAZAWA HISASHI

## 54) CONNECTION UNIT FOR INK-JET RECORDING DEVICE

### 57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a connection unit for applying ink while maintaining a negative pressure in a recording head, and preventing leakage of the ink in an ink storage chamber or evaporation of an ink solvent.

**SOLUTION:** This device comprises an ink storage chamber 2 elongating in the vertical direction formed on one side, and a negative pressure generating part 3 formed on the other side, an atmosphere communication connection opening 4 and an ink inflow connection opening 5, each comprising a cylindrical member for connection with the outside, formed in the upper part and the lower part of the ink storage chamber 2, an ink outflow opening 6 communicating with a recording head formed in the lowermost part, valve elements 10, 20 maintained normally in a closed state by a spring and to be opened in the case an ink cartridge is mounted, provided in each connection opening such that the ink storage chamber 2 is maintained in the sealed state by the valve elements 10, 20 in the case the ink cartridge is detached.



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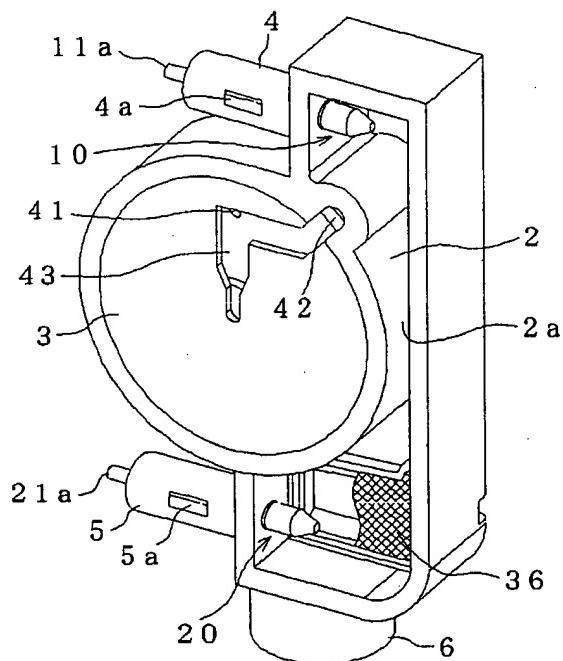
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(54)【発明の名称】 インクジェット記録装置用接続ユニット

(57)【要約】

【課題】 インク貯蔵室のインクの漏れ出しや、インク溶媒の揮散を防止しつつ、記録ヘッドに負圧を維持してインクを供給する接続ユニットを提供すること。

【解決手段】 一側に上下方向に延びるインク貯蔵室2と、他側に負圧発生部3が形成され、インク貯蔵室2の上部、及び下部にそれぞれ外部との接続を行う筒状体からなる大気連通用接続口4と、インク流入用接続口5が形成され、また最下部には記録ヘッドに連通するインク流出口6が形成され、バネにより常時閉弁状態を維持し、かつインクカートリッジが装着された場合に開弁する弁体10、20が各接続口に装填されていて、インクカートリッジが取り外されている状態では、インク貯蔵室2が弁体10、20により密封状態に維持される。



### 【特許請求の範囲】

【請求項 1】 上下方向に延びるインク貯蔵室と、負圧発生部が形成され、前記インク貯蔵室の上部、及び下部にそれぞれ外部との接続を行う筒状体からなる大気連通用接続口と、インク流入用接続口が形成され、また最下部には記録ヘッドに連通するインク流出口が形成され、バネにより常時閉弁状態を維持し、かつインク供給手段が装着された場合に開弁する弁体が前記各接続口に装填されているインクジェット記録装置用接続ユニット。

【請求項 2】 前記インク貯蔵室に毛細管力によりインクを保持する狭部が形成されている請求項 1 に記載のインクジェット記録装置用接続ユニット。

【請求項 3】 前記負圧発生部が、前記インク貯蔵室の最低のインクレベルを維持すべき領域に張り出している請求項 2 に記載のインクジェット記録装置用接続ユニット。

【請求項 4】 前記インク貯蔵室の最低のインクレベルを維持すべき領域に浮遊体の降下を阻止できる狭部が形成され、前記狭部と前記浮遊体による毛細管力により前記インク貯蔵室の最低のインクレベルが維持される請求項 1 に記載のインクジェット記録装置用接続ユニット。

【請求項 5】 前記負圧発生部が、インク貯蔵室と連通する断面円形の凹部からなる弁室に、膜弁を収容して、前記インク流出口のインクの圧力が規定よりも低下した場合に開弁する差圧弁として構成されている請求項 1 に記載のインクジェット記録装置用接続ユニット。

【請求項 6】 前記負圧発生部の上流側にフィルタが配置されている請求項 1 に記載のインクジェット記録装置用接続ユニット。

### 【発明の詳細な説明】

#### 【0001】

【発明の属する技術分野】本発明は、印刷信号に対応してインク滴を吐出する記録ヘッドと、インクカートリッジと接続する接続ユニットの構造に関する。

#### 【0002】

【従来の技術】インクジェット記録装置は、通常、記録用紙の紙幅方向に往復動するキャリッジに印刷信号に対応してインク滴を吐出するインクジェット記録ヘッドを搭載して、外部のインクタンクから記録ヘッドにインクを供給するように構成されている。このようなインクタンク等のインク貯蔵容器は、小型の記録装置にあってはキャリッジに着脱可能に搭載され、また大型の記録装置にあっては、函体に設置されてインク供給チューブを介して記録ヘッドに接続されている。

【0003】キャリッジに搭載されるインクタンクは、キャリッジの往復動によるインクの波立ち等による圧力変化を可及的に減少させるため、通常、スポンジ等の多孔質材を収容し、これにインクを含浸させて構成されている。

【0004】また、函体に設置された大容量のインク袋からインク供給チューブを介してインクの供給を受ける場合にも、キャリッジの往復動によるチューブの屈曲に起因するインク圧の変化を防止するため、キャリッジの運動によるインク圧の変化を防止するためのダンピング機能を備えたサブタンクを介して記録ヘッドにインクを供給するように構成されている。

#### 【0005】

【発明が解決しようとする課題】このため、前者にあっては多孔質材を収容する分だけ、インクタンクのサイズや、また重量が収容可能なインク量に比較して大きくなるという問題があり、また後者にあっては、揺動によるインクの圧力変化を防止する機構が必要となり構造が複雑化するという問題がある。本発明は、このような問題に鑑みてなされたものであって、その目的とするところは、キャリッジの移動に関わりなく印刷に適した負圧状態を維持してインクカートリッジのインクを記録ヘッドに供給することができるインクカートリッジと記録ヘッドとを接続する接続ユニットを提供することである。

#### 【0006】

【課題を解決するための手段】このような課題を解決するために本発明においては、上下方向に延びるインク貯蔵室と、負圧発生部が形成され、前記インク貯蔵室の上部、及び下部にそれぞれ外部との接続を行う筒状体からなる大気連通用接続口と、インク流入用接続口が形成され、また最下部には記録ヘッドに連通するインク流出口が形成され、バネにより常時閉弁状態を維持し、かつインク供給手段が装着された場合に開弁する弁体が前記各接続口に装填されている。

#### 【0007】

【作用】インクカートリッジ等のインク供給手段が取り外されている状態では、インク貯蔵室が弁体により密封状態に維持され、インクの漏洩やインク溶媒の揮散が防止される。またインク供給手段が装着された状態では、弁体が開弁してインク貯蔵室が大気に連通されてインク流出口からインクを一定の負圧を維持しながら記録ヘッドに供給することが可能となる。

#### 【0008】

【発明の実施の形態】そこで以下に本発明の詳細を図示した実施例に基づいて説明する。図 1 乃至図 3 は、それぞれ本発明の接続ユニットの一実施例を示すものであって、この接続ユニット 1 は、一側に上下方向に延びるインク貯蔵室 2 が、また他側に後述する負圧発生部 3 が形成され、インク貯蔵室 2 の上部、及び下部にはそれぞれ外部との接続を行う筒状体からなる大気連通用接続口 4 と、インク流入用接続口 5 が形成され、また最下部には記録ヘッドに連通するインク流出口 6 が形成されている。

【0009】インク貯蔵室 2 の中央部には、この実施例では負圧発生部 3 を突出させて、毛細管力が発現できる

程度の狭部 2 a が形成されている。

【0010】各接続口 4、5 には、その周面に連通用の窓 4 a、5 a が形成されていて、内部に弁体 10、20 が軸方向に移動可能に収容されている。各弁体 10、20 は、閉弁状態では一端 11 a、21 a が接続口 4、5 から突出するスライド軸 11、21 の他端側に、接続口 4、5 と連通する開口 12、22 を封止する弾性体からなるパッキン 13、23 を嵌装され、バネ 14、24 により開口 12、22 にパッキン 13、23 を弾接させるように接続口 4、5 に挿入されている。

【0011】負圧発生部 3 は、図 3 に示したようにインク貯蔵室 2 と連通する断面円形の凹部からなる弁室 30 に、膜弁 31、及び膜弁 31 の外周を固定する固定具を兼ねた流路形成部材 32 を収容し、インク貯蔵室 2 を含む領域を遮気性を備えた膜 33 により封止して構成されている。弁室 30 の中心には凸部 34 が、また膜弁 31 には凸部 34 と対向する位置に貫通孔 35 が形成されている。

【0012】図 4 (a)、(b) は、それぞれ負圧発生部 3 に形成されたインク流路を表裏に分けて示す図であって、インク貯蔵室 2 からフィルタ 36 に流入する流れ①、通孔 37 から流路 38 を経由して弁室 30 の通孔 39 に流入する流れ②、膜弁 31 を通過する流れ③、弁室 30 の通孔 40 と通孔 41、42 とを結ぶ流路 43 を経由する流れ④、及びインク流出口 6 に連通する通孔 44 と通孔 42 とを接続する流路 45 を流れる流れ⑤によりに連通する。なお、図 3 における符号 46 は、インク流出口 6 に嵌め込まれるパッキンを示す。

【0013】図 5 は、負圧発生部 3 の断面構造を示すものであって、膜弁 31 は、周囲を厚肉部とするダイヤフラムとして形成されていて、バネ 47 により貫通孔 35 が凸部 34 に弾接されている。このバネ 47 は、その弾圧力が、記録ヘッドへのインクの圧力が負圧を維持し、かつ記録動作に追従してインクを供給できる程度に設定されている。

【0014】このような構成により、記録ヘッドでのインクの消費が進んでインク流出口 6 の負圧が大きくなると、膜弁 31 の表裏の差圧が大きくなるため、インク貯蔵室 2 のインクの圧力を受けた膜弁 31 がバネ 47 の付勢力に抗して凸部 34 から離れる。これにより膜弁 31 の貫通孔 35 が開放され、通孔 39 と通孔 42 が連通し、インク流出口 6 にインクが流れ込む。記録ヘッドにインクが流れ込んで、インク流出口 6 の負圧が小さくなると、膜弁 31 がバネ 47 の付勢力により凸部 34 に押し付けられて貫通孔 35 が凸部 34 により封止される。以下、インク流出口 6 のインク圧力が一定の負圧となるように、膜弁 31 は凸部 34 との接離を繰返す。

【0015】このように構成された接続ユニットは、例えば図 6 に示したように本体にインク収容室 50 が形成され、上部に大気連通口 51 が、また下部にインク流出

口 52 が形成され、それぞれにバネ 53、54 により常時大気連通口 51、インク流出口 52 に弾圧された弁体 55、56 を備えたカートリッジ 57 を、図 7 に示したように接続ユニット 1 に装着すると、図 8 に示したように接続ユニット 1 のスライド軸 11、21 がバネ 14、24 に抗して押圧されてそれぞれの開口 12、22 が開放され、同様にインクカートリッジ 57 の弁体 55、56 も開放される（図 9 (a)、(b)）。

【0016】これにより、インクカートリッジ 57 のインク室 50 が弁体 55 及び細溝 58 を介して大気に開放されてインク室のインクが接続ユニット 1 のインク貯蔵室 2 に流れ込む。そして前述したように印刷に伴って記録ヘッドによりインクが消費されると、インク流出口 6 のインクが一定の負圧となるように膜弁 32 が開閉してインク貯蔵室 2 のインクを記録ヘッドに供給する。

【0017】このようにして当初規定のインク量が充填されていたインクカートリッジ 57 (図 10 (I)) のインクの消費が進んで図 10 (II) に示したように接続ユニット 1 のインク貯蔵室 2 に形成されているの狭部 2 a までインク液面が低下すると、インク貯蔵室 2 のインクの液面は狭部 2 a の毛細管力により狭部 2 a に維持される。

【0018】一方、記録ヘッドのインクの消費により発生した負圧に対応して膜弁 31 が開弁すると、負圧がインクカートリッジに作用するから、インクカートリッジのインクが負圧発生部 3 を経由して記録ヘッドに流れこむ。

【0019】インク貯蔵室 2 のインクの液面をフィルタ 36、望ましくは通孔 37 よりも上位のレベル H に維持しながら、インクカートリッジ 57 のインクを記録ヘッドに供給し（図 10 (III)）、交換が困難な接続ユニット内でインク切れを招くことなく、インクカートリッジのインクを全て記録ヘッドに排出する（図 10 (IV)）。

【0020】一方、カートリッジのインクが消費され尽くしたり、またインクの交換のためにインクカートリッジが接続ユニット 1 から取り外されると、接続ユニット 1 及びインクカートリッジ 57 のスライド軸 11、21 や弁体 55、56 は、共に支持を失ってバネ 14、24、53、54 の付勢力により閉弁する。

【0021】これにより、接続ユニット 1 の大気連通用接続口 4、及びインク流入用接続口 5 が遮断され、大気連通用接続口 4 からのインク溶媒の揮散や、またインク流入用接続口 5 からのインクの流出が防止される。

【0022】なお、上述の実施例においては、インク貯蔵室 2 の最低インクレベル H を狭部の毛細管力で維持するようにしているが、図 11 (I) 乃至 (IV) に示したように、断面円形を有する浮遊体 60 をインク貯蔵室 2 の上部に挿入すると、狭部 2 a の毛細管力に依存することなくインクを所定のレベルに保持することができる。

【0023】すなわち、図11(I)に示したよう所定量のインクが存在する状態では浮遊体60は狭部2aよりも上方に位置するからインクの排出を阻害することはない。インクの液面が維持すべきレベルHまで低下すると、浮遊体60が狭部2aで降下を阻止されて毛細管力を発現し、前述と同様にインクカートリッジ57のインクの減少に関わりなくインク貯蔵室2のインクの液面をレベルHに維持する(図11(II)(III))。そして、この状態を維持してインクカートリッジ57のインクを最後まで記録ヘッドに供給する(図11(IV))。

【0024】なお、上述の実施例においては接続ユニット1にインクカートリッジ57を直接装着する場合について説明したが、図12に示したように接続ユニット1のインク貯蔵室2の液面を維持すべき高さに液面センサー61を内蔵させ、液面センサー61により制御される送液ポンプ62を介してチューブ63によりインク袋等のインク貯蔵体64のインク流出口65に接続するようにも同様の作用を奏する。

【0025】この場合には、インク貯蔵室2の上部に大気連通用の開口66を形成し、ここを撥水性と通気性を備えた膜67により封止するのが望ましい。

【発明の効果】以上、説明したように本発明においては、上下方向に延びるインク貯蔵室と、負圧発生部が形成され、インク貯蔵室の上部、及び下部にそれぞれ外部との接続を行う筒状体からなる大気連通用接続口と、インク流入用接続口が形成され、また最下部には記録ヘッドに連通するインク流出口が形成され、バネにより常時閉弁状態を維持し、かつインク供給手段が装着された場合に開弁する弁体が各接続口に装填されているので、インク供給手段が取り外されている状態では、インク貯蔵室が弁体により密封状態に維持して、インクの漏洩やインク溶媒の揮散を防止でき、またインク供給手段が装着された状態では、弁体が開弁してインク貯蔵室が大気に連通してインク流出口からインクを一定の負圧を維持しながら記録ヘッドに供給することが可能となる。

#### 【図面の簡単な説明】

【図1】本発明の接続ユニットの一実施例を示す斜視図である。

【図2】同上接続ユニットの一実施例を示す断面図である。

【図3】同上接続ユニットの一実施例を示す組立分解斜視図である。

【図4】図(a)、(b)は、それぞれ同上接続ユニットの負圧発生部のインクの流れを示す図である。

【図5】同上負圧発生部の断面構造及びインクの流れを示す図である。

【図6】同上接続ユニットに適したインクカートリッジの一実施例を示す図である。

【図7】同上接続ユニットにインクカートリッジが装着された状態を示す図である。

【図8】同上接続ユニットにインクカートリッジが装着された状態の断面構造を示す図である。

【図9】図(a)、(b)は、それぞれ接続口の状態を拡大して示す断面図である。

【図10】図(I)乃至図(IV)は、それぞれ同上接続ユニットとインクカートリッジのインクの消費の状態を示す図である。

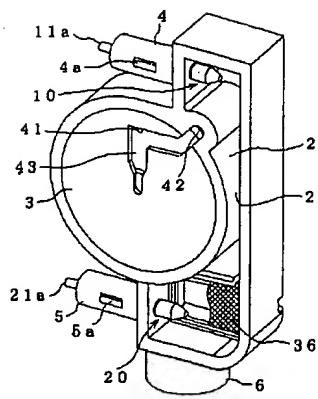
【図11】図(I)乃至図(IV)は、それぞれ同上接続ユニットの他の実施例をインクの消費の状態で示す図である。

【図12】本発明の接続ユニットの他の適用例を示す構成図である。

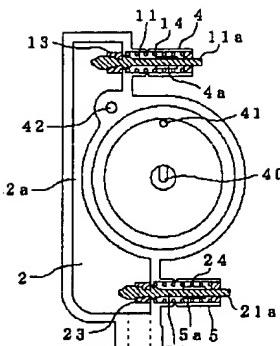
#### 【符号の説明】

- 1 接続ユニット
- 2 インク貯蔵室
- 2a 狹部
- 3 負圧発生部
- 4 大気連通用接続口
- 5 インク流入用接続口
- 6 インク流出口
- 10、20 弁体
- 11 スライド軸
- 12、22 開口
- 13、23 パッキン
- 14、24、47、53、54 バネ
- 30 弁室
- 31 膜弁
- 32 流路形成部材
- 33 膜
- 34 凸部
- 35 貫通孔
- 36 フィルタ
- 57 インクカートリッジ
- 60 浮遊体

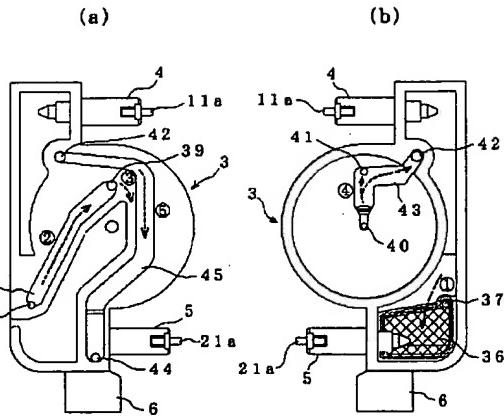
【図1】



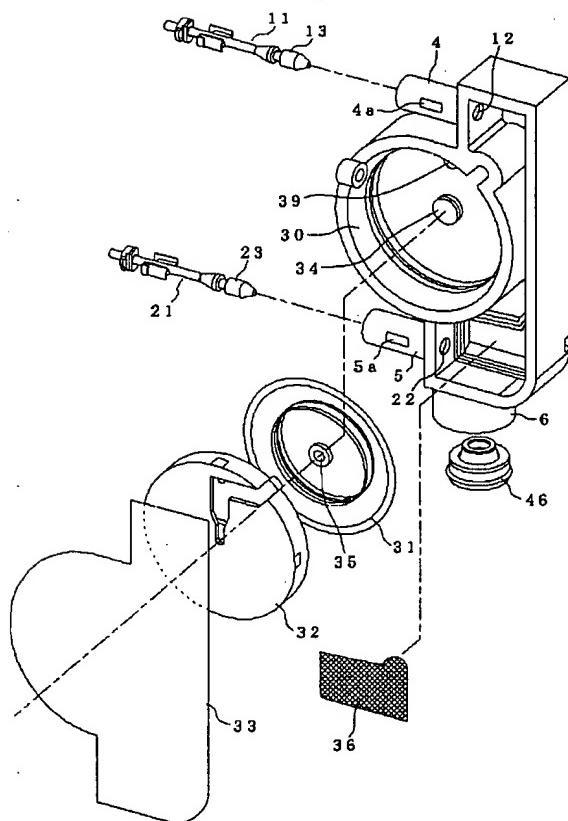
【図2】



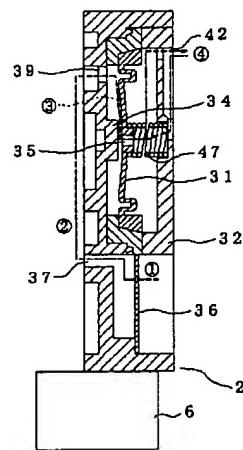
【図4】



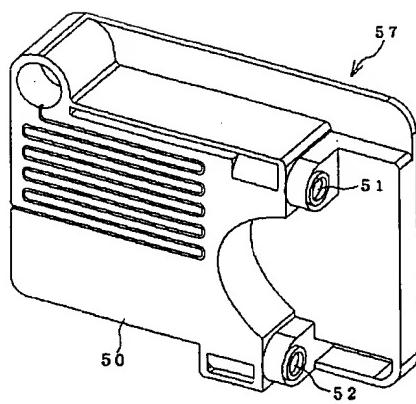
【図3】



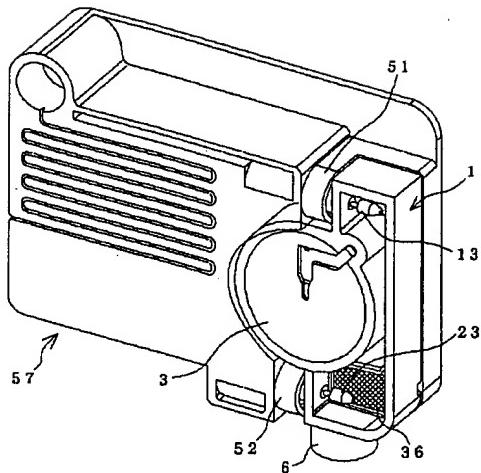
【図5】



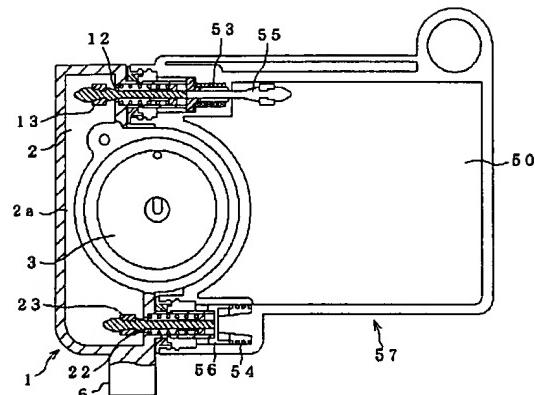
【図6】



【図 7】



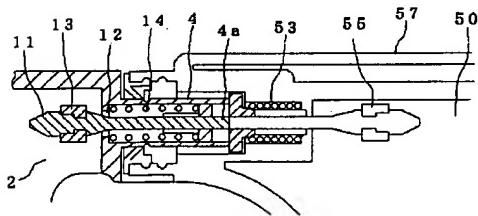
【図 8】



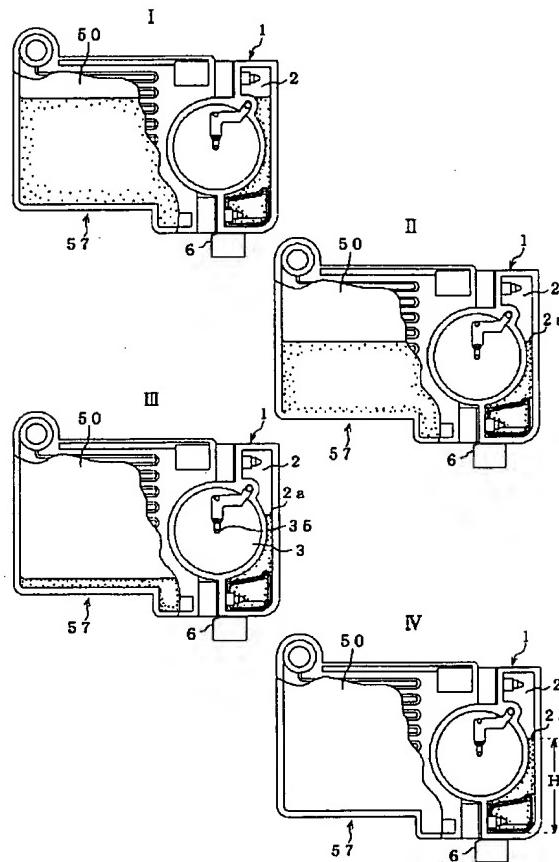
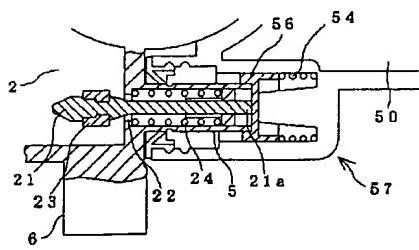
【図 10】

【図 9】

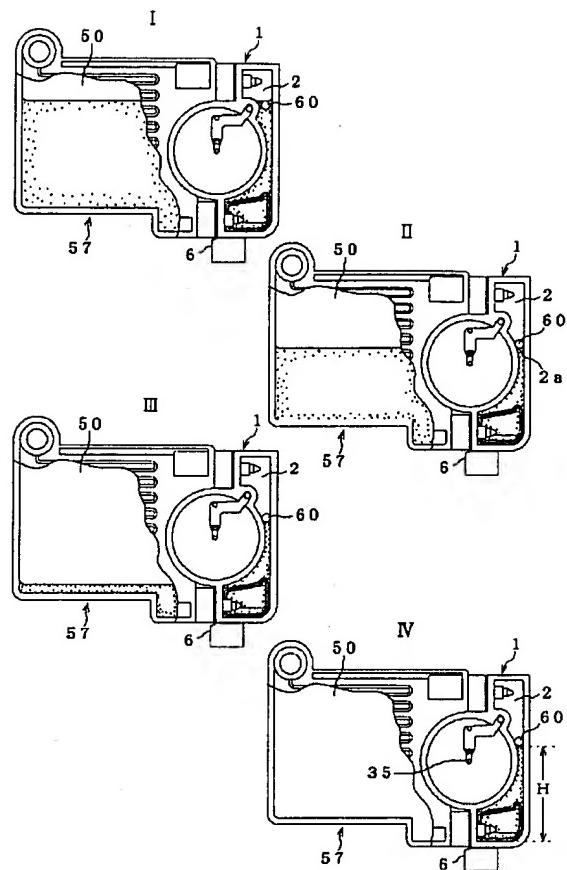
(a)



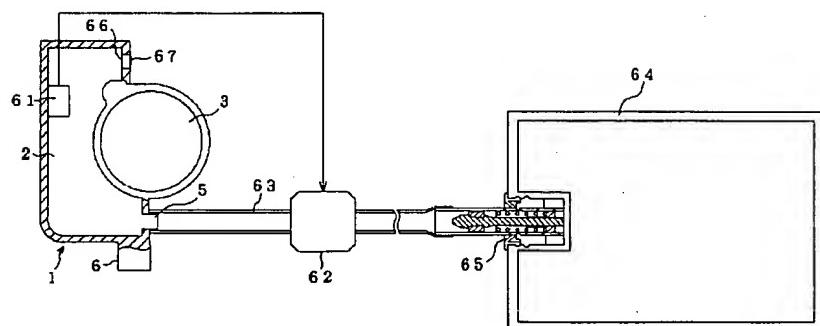
(b)



【図11】



【図12】



[Patent number]

[Date of registration]

Number of appeal against examiner's decision of  
ejection]

Date of requesting appeal against examiner's  
decision of rejection]

Date of extinction of right]

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1. This document has been translated by computer. So the translation may not reflect the original precisely.

2. \*\*\*\* shows the word which can not be translated.

3. In the drawings, any words are not translated.

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## CLAIMS

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[Claim(s)]

[Claim 1] The ink stockroom which extends in the vertical direction, and the negative pressure generating section are formed. Each in the upper part of said ink stockroom, and the lower part The end connection for an atmospheric-air free passage which consists of a tube-like object which makes connection with the exterior, The connection unit for ink jet recording devices by which said each end connection is loaded with the valve element which opens when the end connection for an ink inflow is formed, and the ink tap hole which is open for free passage to a recording head is formed in the bottom, and normally closed valvate form voice is maintained with a spring and it is equipped with an ink supply means.

[Claim 2] The connection unit for ink jet recording devices according to claim 1 by which the narrow part which holds ink according to the capillary tube force is formed in said ink stockroom.

[Claim 3] The connection unit for ink jet recording devices according to claim 2 jutted out over the field to which said negative pressure generating section should maintain the minimum ink level of said ink stockroom.

[Claim 4] The connection unit for ink jet recording devices according to claim 1 which the narrow part which can prevent descent of a suspension object is formed in the field which should maintain the minimum ink level of said ink stockroom, and is boiled according to the capillary tube force with said narrow part and said suspension object and by which the minimum ink level of said ink stockroom is maintained.

[Claim 5] The connection unit for ink jet recording devices according to claim 1 constituted as a differential pressure regulating valve which opens when a film valve is held in the valve chest which said negative pressure generating section becomes from an ink stockroom and the crevice of a cross-section round shape open for free passage and the pressure of the ink of said ink tap hole falls to it rather than a convention.

[Claim 6] The connection unit for ink jet recording devices according to claim 1 by which the filter is arranged at the upstream of said negative pressure generating section.

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the structure of the connection unit which connects the recording head which carries out the regurgitation of the ink droplet corresponding

to a printing signal, and an ink cartridge.

[0002]

[Description of the Prior Art] An ink jet recording apparatus carries the ink jet recording head which usually carries out the regurgitation of the ink droplet to the carriage which reciprocates in the paper width direction of a record form corresponding to a printing signal, and it is constituted so that ink may be supplied to a recording head from an external ink tank. If they are carried in carriage removable if ink storage containers, such as such an ink tank, are in a small recording apparatus, and they are in a large-sized recording apparatus, they are installed in a box and connected to the recording head through the ink supply tube.

[0003] ink according [ the ink tank carried in carriage ] to reciprocation of carriage -- choppy -- etc. -- in order to decrease the pressure variation to depend as much as possible, usually porosity material, such as sponge, is held, ink is infiltrated into this, and it is constituted.

[0004] Moreover, also when receiving supply of ink from the mass ink bag installed in the box through an ink supply tube, in order to prevent change of ink \*\* resulting from crookedness of the tube by reciprocation of carriage, it is constituted so that ink may be supplied to a recording head through the subtank equipped with the damping function for preventing change of ink \*\* by movement of carriage.

[0005]

[Problem(s) to be Solved by the Invention] For this reason, only the part which holds porosity material if it is in the former has the problem that the device in which the pressure variation of the ink by rocking is prevented is needed if there is a problem of becoming large as compared with the size and the amount of ink which can hold weight again of an ink tank and it is in the latter, and structure is complicated. The place which this invention is made in view of such a problem, and is made into the purpose is offering the connection unit which connects the ink cartridge which can maintain the negative pressure condition which was concerned with migration of carriage and was [ that there is nothing ] suitable for printing, and can supply the ink of an ink cartridge to a recording head, and a recording head.

[0006]

[Means for Solving the Problem] In order to solve such a technical problem, it sets to this invention. The ink stockroom which extends in the vertical direction, and the negative pressure generating section are formed. Each in the upper part of said ink stockroom, and the lower part The end connection for an atmospheric-air free passage which consists of a tube-like object which makes connection with the exterior, Said each end connection is loaded with the valve element which opens when the end connection for an ink inflow is formed, and the ink tap hole which is open for free passage to a recording head is formed in the bottom, and normally closed valvate form voice is maintained with a spring and it is equipped with an ink supply means.

[0007]

[Function] In the condition that ink supply means, such as an ink cartridge, are removed, an ink stockroom is maintained by the seal condition by the valve element, and leakage of ink and the vaporization of an ink solvent are prevented. Moreover, in the condition of having been equipped with the ink supply means, a valve element opens, an ink stockroom is opened for free passage by atmospheric air, and it becomes possible from an ink tap hole to supply ink to a recording head, maintaining fixed negative pressure.

[0008]

[Embodiment of the Invention] Then, based on the example illustrating the detail of this invention, it explains below. Drawing 1 thru/or drawing 3 are what shows one example of the

connection unit of this invention, respectively. This connection unit 1 The negative pressure generating section 3 which the ink stockroom 2 which extends in the vertical direction in 1 side mentions later to the side else again is formed. In the upper part of the ink stockroom 2, and the lower part, each The end connection 4 for an atmospheric-air free passage which consists of a tube-like object which makes connection with the exterior, The end connection 5 for an ink inflow is formed, and the ink tap hole 6 which is open for free passage to a recording head is formed in the bottom.

[0009] In this example, the negative pressure generating section 3 is made to project in the center section of the ink stockroom 2, and narrow part 2a which is extent which can discover the capillary tube force is formed in it.

[0010] The apertures 4a and 5a for a free passage are formed in the peripheral surface at each end connections 4 and 5, and valve elements 10 and 20 are held in the interior by shaft orientations movable. In the state of clausilium, the packing 13 and 23 which consists of an elastic body which closes end connections 4 and 5 and the openings 12 and 22 open for free passage is fitted in each valve elements 10 and 20, and they are inserted in the other end side of the slide shafts 11 and 21 with which Ends 11a and 21a project from end connections 4 and 5 at end connections 4 and 5 so that openings 12 and 22 may be made to \*\*\*\* packing 13 and 23 with springs 14 and 24.

[0011] The negative pressure generating section 3 holds the passage formation member 32 which served as the fastener which fixes the periphery of a film valve 31 and a film valve 31 to the valve chest 30 which consists of an ink stockroom 2 and a crevice of a cross-section round shape open for free passage, as shown in drawing 3, closes a field including the ink stockroom 2 with the film 33 equipped with \*\*\*\*\*, and is constituted. The through tube 35 is formed in the location in which heights 34 counter a film valve 31 with heights 34 at the core of the valve chest 30 again.

[0012] Drawing 4 (a) and (b) are drawings in which dividing into a front flesh side the ink passage formed in the negative pressure generating section 3, respectively, and showing it. Flow \*\* which flows into a filter 36 from the ink stockroom 2 and which flows and flows into the through-hole 39 of the valve chest 30 via passage 38 from \*\* and a through-hole 37, the passage 45 which connects the through-hole 44 which goes via the passage 43 which passes a film valve 31, and which it flows and connects \*\*, and the through-hole 40 and through-holes 41 and 42 of the valve chest 30, and which flows and is open for free passage to \*\* and the ink tap hole 6, and a through-hole 42 is flowed -- it flows, and it is alike with \*\* and open for free passage. In addition, the sign 46 in drawing 3 shows packing inserted in the ink tap hole 6.

[0013] Drawing 5 shows the cross-section structure of the negative pressure generating section 3, the film valve 31 is formed as diaphragm which uses a perimeter as a heavy-gage part, and the through tube 35 is \*\*\*\*(ed) by heights 34 with the spring 47. It is set as extent which the pressure of the ink to a recording head maintains negative pressure, and that suppression force follows this spring 47 at record actuation, and can supply ink.

[0014] If consumption of the ink in a recording head progresses and the negative pressure of the ink tap hole 6 becomes large by such configuration, since the differential pressure of the front flesh side of a film valve 31 will become large, the film valve 31 which received the pressure of the ink of the ink stockroom 2 resists the energization force of a spring 47, and it separates from heights 34. The through tube 35 of a film valve 31 is opened wide by this, a through-hole 39 and a through-hole 42 are open for free passage, and ink flows into the ink tap hole 6. If ink flows into a recording head and the negative pressure of the ink tap hole 6 becomes small, a film valve

31 will be forced on heights 34 by the energization force of a spring 47, and the closure of the through tube 35 will be carried out by heights 34. A film valve 31 repeats attachment and detachment with heights 34 so that the ink pressure of the ink tap hole 6 may serve as fixed negative pressure hereafter.

[0015] Thus, as the constituted connection unit was shown in drawing 6, the ink hold room 50 is formed in a body. The atmospheric-air free passage opening 51 is formed in the upper part, and the ink tap hole 52 is formed in the lower part. If the connection unit 1 is equipped with the \*\* cartridge 57 equipped with the valve elements 55 and 56 always oppressed by each with springs 53 and 54 in the atmospheric-air free passage opening 51 and the ink tap hole 52 as shown in drawing 7 As shown in drawing 8, the slide shafts 11 and 21 of the connection unit 1 resist springs 14 and 24, are pressed, each opening 12 and 22 is opened wide, and the valve elements 55 and 56 of an ink cartridge 57 are opened wide similarly (drawing 9 (a), (b)).

[0016] Thereby, the ink room 50 of an ink cartridge 57 is wide opened by atmospheric air through a valve element 55 and a rill 58, and the ink of an ink room flows into the ink stockroom 2 of the connection unit 1. And a film valve 32 will open and close, and if ink is consumed by the recording head with printing as mentioned above, the ink of the ink stockroom 2 will be supplied to a recording head so that the ink of the ink tap hole 6 may serve as fixed negative pressure.

[0017] Thus, if a liquid ink side falls to forming [ in the ink stockroom 2 of the connection unit 1 ] narrow part 2a as consumption of the ink of an ink cartridge 57 (drawing 10 (I)) in which it filled up with the regular amount of ink at the beginning progresses and it was shown in drawing 10 (II), the oil level of the ink of the ink stockroom 2 will be maintained by narrow part 2a according to the capillary tube force of narrow part 2a.

[0018] On the other hand, if a film valve 31 opens corresponding to the negative pressure generated by consumption of the ink of a recording head, since negative pressure acts on an ink cartridge, the ink of an ink cartridge will flow into a recording head via the negative pressure generating section 3.

[0019] the oil level of the ink of the ink stockroom 2 -- a filter 36 -- all the ink of an ink cartridge is discharged to a recording head, without supplying the ink of an ink cartridge 57 to a recording head (drawing 10 (III)), and exchange inviting an ink piece within a difficult connection unit, maintaining on the level H of a high order rather than a through-hole 37 desirably, (drawing 10 (IV)).

[0020] On the other hand, if all the ink of a cartridge is consumed and an ink cartridge is removed from the connection unit 1 for exchange of ink, both the connection unit 1, and the slide shafts 11 and 21 and valve elements 55 and 56 of an ink cartridge 57 will lose support, and will close it according to the energization force of springs 14, 24, 53, and 54.

[0021] thereby, the end connection 4 for an atmospheric-air free passage of the connection unit 1 and the end connection 5 for an ink inflow intercept -- having -- the vaporization of the ink solvent from the end connection 4 for an atmospheric-air free passage -- moreover, the outflow of the ink from the end connection 5 for an ink inflow is prevented.

[0022] In addition, in an above-mentioned example, although he is trying to maintain the minimum ink level H of the ink stockroom 2 by the capillary tube force of a narrow part, if the suspension object 60 which has a cross-section round shape is inserted in the upper part of the ink stockroom 2 as shown in drawing 11 (I) thru/or (IV), ink can be held on predetermined level, without being dependent on the capillary tube force of narrow part 2a.

[0023] That is, in the condition that the ink of the specified quantity exists as shown in drawing

11 (I), since the suspension object 60 is located more nearly up than narrow part 2a, it does not check discharge of ink. If it falls to the level H which the oil level of ink should maintain, the suspension object 60 will have descent prevented by narrow part 2a, and will discover the capillary tube force, it will be concerned with reduction of the ink of an ink cartridge 57 like the above-mentioned, and the oil level of the ink of the ink stockroom 2 will be maintained on level H that there is nothing (drawing 11 (II), (III)). And this condition is maintained and the ink of an ink cartridge 57 is supplied to a recording head to the last (drawing 11 (IV)).

[0024] In addition, although the case where the connection unit 1 was directly equipped with an ink cartridge 57 in an above-mentioned example was explained, a liquid level sensor 61 is made to build in the height which should maintain the oil level of the ink stockroom 2 of the connection unit 1, as shown in drawing 12, and the same operation is done so even if it makes it connect with the ink tap hole 65 of the ink storage objects 64, such as an ink bag, with a tube 63 through the liquid-sending pump 62 controlled by the liquid level sensor 61.

[0025] In this case, it is desirable to form the opening 66 for an atmospheric-air free passage in the upper part of the ink stockroom 2, and to close this with the film 67 equipped with water repellence and permeability.

[Effect of the Invention] As mentioned above, the ink stockroom which extends in the vertical direction in this invention as explained, The negative pressure generating section is formed. Each in the upper part of an ink stockroom, and the lower part The end connection for an atmospheric-air free passage which consists of a tube-like object which makes connection with the exterior, Since each end connection is loaded with the valve element which opens when the end connection for an ink inflow is formed, and the ink tap hole which is open for free passage to a recording head is formed in the bottom, and normally closed valvate form voice is maintained with a spring and it is equipped with an ink supply means In the condition that the ink supply means is removed In the condition of the ink stockroom having maintained in the seal condition by the valve element, and could prevent leakage of ink, and the vaporization of an ink solvent, and having been equipped with the ink supply means A valve element opens, an ink stockroom is open for free passage to atmospheric air, and it becomes possible from an ink tap hole to supply ink to a recording head, maintaining fixed negative pressure.

.In the drawings, any words are not translated.

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## TECHNICAL FIELD

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[Field of the Invention] This invention relates to the structure of the connection unit which connects the recording head which carries out the regurgitation of the ink droplet corresponding to a printing signal, and an ink cartridge.

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## PRIOR ART

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[Description of the Prior Art] An ink jet recording apparatus carries the ink jet recording head which usually carries out the regurgitation of the ink droplet to the carriage which reciprocates in the paper width direction of a record form corresponding to a printing signal, and it is constituted so that ink may be supplied to a recording head from an external ink tank. If they are carried in carriage removable if ink storage containers, such as such an ink tank, are in a small recording apparatus, and they are in a large-sized recording apparatus, they are installed in a box and

connected to the recording head through the ink supply tube.

[0003] ink according [ the ink tank carried in carriage ] to reciprocation of carriage -- choppy -- etc. -- in order to decrease the pressure variation to depend as much as possible, usually porosity material, such as sponge, is held, ink is infiltrated into this, and it is constituted.

[0004] Moreover, also when receiving supply of ink from the mass ink bag installed in the box through an ink supply tube, in order to prevent change of ink \*\* resulting from crookedness of the tube by reciprocation of carriage, it is constituted so that ink may be supplied to a recording head through the subtank equipped with the damping function for preventing change of ink \*\* by movement of carriage.

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## EFFECT OF THE INVENTION

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[Effect of the Invention] As mentioned above, the ink stockroom which extends in the vertical direction in this invention as explained, The negative pressure generating section is formed. Each in the upper part of an ink stockroom, and the lower part The end connection for an atmospheric-air free passage which consists of a tube-like object which makes connection with the exterior, Each end connection is loaded with the valve element which opens when the end connection for an ink inflow is formed, and the ink tap hole which is open for free passage to a recording head is formed in the bottom, and normally closed valvate form voice is maintained with a spring and it is equipped with an ink supply means. Therefore, in the condition of the ink stockroom having maintained in the seal condition by the valve element, and could prevent leakage of ink, and the vaporization of an ink solvent, and having been equipped with the ink supply means, a valve element opens, an ink stockroom is open for free passage to atmospheric air, and the condition that the ink supply means is removed enables it to supply ink to a recording head, maintaining fixed negative pressure from an ink tap hole.

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## TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] For this reason, only the part which holds porosity material if it is in the former has the problem that the device in which the pressure variation of the ink by rocking is prevented is needed if there is a problem of becoming large as compared with the size and the amount of ink which can hold weight again of an ink tank and it is in the latter, and structure is complicated. The place which this invention is made in view of such a problem, and is made into the purpose is offering the connection unit which connects the ink cartridge which can maintain the negative pressure condition which was concerned with migration of carriage and was [ that there is nothing ] suitable for printing, and can supply the ink of an ink cartridge to a recording head, and a recording head.

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## MEANS

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[Means for Solving the Problem] In order to solve such a technical problem, it sets to this invention. The ink stockroom which extends in the vertical direction, and the negative pressure generating section are formed. Each in the upper part of said ink stockroom, and the lower part The end connection for an atmospheric-air free passage which consists of a tube-like object which makes connection with the exterior, Said each end connection is loaded with the valve element which opens when the end connection for an ink inflow is formed, and the ink tap hole

which is open for free passage to a recording head is formed in the bottom, and normally closed valve form voice is maintained with a spring and it is equipped with an ink supply means.

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## OPERATION

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[Function] In the condition that ink supply means, such as an ink cartridge, are removed, an ink stockroom is maintained by the seal condition by the valve element, and leakage of ink and the vaporization of an ink solvent are prevented. Moreover, in the condition of having been equipped with the ink supply means, a valve element opens, an ink stockroom is opened for free passage by atmospheric air, and it becomes possible from an ink tap hole to supply ink to a recording head, maintaining fixed negative pressure.

[0008]

[Embodiment of the Invention] Then, based on the example illustrating the detail of this invention, it explains below. Drawing 1 thru/or drawing 3 are what shows one example of the connection unit of this invention, respectively. This connection unit 1 The negative pressure generating section 3 which the ink stockroom 2 which extends in the vertical direction in 1 side mentions later to the side else again is formed. In the upper part of the ink stockroom 2, and the lower part, each The end connection 4 for an atmospheric-air free passage which consists of a tube-like object which makes connection with the exterior, The end connection 5 for an ink inflow is formed, and the ink tap hole 6 which is open for free passage to a recording head is formed in the bottom.

[0009] In this example, the negative pressure generating section 3 is made to project in the center section of the ink stockroom 2, and narrow part 2a which is extent which can discover the capillary tube force is formed in it.

[0010] The apertures 4a and 5a for a free passage are formed in the peripheral surface at each end connections 4 and 5, and valve elements 10 and 20 are held in the interior by shaft orientations movable. In the state of clausilium, the packing 13 and 23 which consists of an elastic body which closes end connections 4 and 5 and the openings 12 and 22 open for free passage is fitted in each valve elements 10 and 20, and they are inserted in the other end side of the slide shafts 11 and 21 with which Ends 11a and 21a project from end connections 4 and 5 at end connections 4 and 5 so that openings 12 and 22 may be made to \*\*\*\* packing 13 and 23 with springs 14 and 24.

[0011] The negative pressure generating section 3 holds the passage formation member 32 which served as the fastener which fixes the periphery of a film valve 31 and a film valve 31 to the valve chest 30 which consists of an ink stockroom 2 and a crevice of a cross-section round shape open for free passage, as shown in drawing 3, closes a field including the ink stockroom 2 with the film 33 equipped with \*\*\*\*\*, and is constituted. The through tube 35 is formed in the location in which heights 34 counter a film valve 31 with heights 34 at the core of the valve chest 30 again.

[0012] Drawing 4 (a) and (b) are drawings in which dividing into a front flesh side the ink passage formed in the negative pressure generating section 3, respectively, and showing it. Flow \*\* which flows into a filter 36 from the ink stockroom 2 and which flows and flows into the through-hole 39 of the valve chest 30 via passage 38 from \*\* and a through-hole 37, the passage 45 which connects the through-hole 44 which goes via the passage 43 which passes a film valve 31, and which it flows and connects \*\*, and the through-hole 40 and through-holes 41 and 42 of the valve chest 30, and which flows and is open for free passage to \*\* and the ink tap hole 6, and

a through-hole 42 is flowed -- it flows, and it is alike with \*\* and open for free passage. In addition, the sign 46 in drawing 3 shows packing inserted in the ink tap hole 6.

[0013] Drawing 5 shows the cross-section structure of the negative pressure generating section 3, the film valve 31 is formed as diaphragm which uses a perimeter as a heavy-gage part, and the through tube 35 is \*\*\*\*(ed) by heights 34 with the spring 47. It is set as extent which the pressure of the ink to a recording head maintains negative pressure, and that suppression force follows this spring 47 at record actuation, and can supply ink.

[0014] If consumption of the ink in a recording head progresses and the negative pressure of the ink tap hole 6 becomes large by such configuration, since the differential pressure of the front flesh side of a film valve 31 will become large, the film valve 31 which received the pressure of the ink of the ink stockroom 2 resists the energization force of a spring 47, and it separates from heights 34. The through tube 35 of a film valve 31 is opened wide by this, a through-hole 39 and a through-hole 42 are open for free passage, and ink flows into the ink tap hole 6. If ink flows into a recording head and the negative pressure of the ink tap hole 6 becomes small, a film valve 31 will be forced on heights 34 by the energization force of a spring 47, and the closure of the through tube 35 will be carried out by heights 34. A film valve 31 repeats attachment and detachment with heights 34 so that the ink pressure of the ink tap hole 6 may serve as fixed negative pressure hereafter.

[0015] Thus, as the constituted connection unit was shown in drawing 6, the ink hold room 50 is formed in a body. The atmospheric-air free passage opening 51 is formed in the upper part, and the ink tap hole 52 is formed in the lower part. If the connection unit 1 is equipped with the \*\* cartridge 57 equipped with the valve elements 55 and 56 always oppressed by each with springs 53 and 54 in the atmospheric-air free passage opening 51 and the ink tap hole 52 as shown in drawing 7. As shown in drawing 8, the slide shafts 11 and 21 of the connection unit 1 resist springs 14 and 24, are pressed, each opening 12 and 22 is opened wide, and the valve elements 55 and 56 of an ink cartridge 57 are opened wide similarly ( drawing 9 (a), (b)).

[0016] Thereby, the ink room 50 of an ink cartridge 57 is wide opened by atmospheric air through a valve element 55 and a rill 58, and the ink of an ink room flows into the ink stockroom 2 of the connection unit 1. And a film valve 32 will open and close, and if ink is consumed by the recording head with printing as mentioned above, the ink of the ink stockroom 2 will be supplied to a recording head so that the ink of the ink tap hole 6 may serve as fixed negative pressure.

[0017] Thus, if a liquid ink side falls to forming [ in the ink stockroom 2 of the connection unit 1 ] narrow part 2a as consumption of the ink of an ink cartridge 57 ( drawing 10 (I) ) in which it filled up with the regular amount of ink at the beginning progresses and it was shown in drawing 10 (II), the oil level of the ink of the ink stockroom 2 will be maintained by narrow part 2a according to the capillary tube force of narrow part 2a.

[0018] On the other hand, if a film valve 31 opens corresponding to the negative pressure generated by consumption of the ink of a recording head, since negative pressure acts on an ink cartridge, the ink of an ink cartridge will flow into a recording head via the negative pressure generating section 3.

[0019] the oil level of the ink of the ink stockroom 2 -- a filter 36 -- all the ink of an ink cartridge is discharged to a recording head, without supplying the ink of an ink cartridge 57 to a recording head ( drawing 10 (III) ), and exchange inviting an ink piece within a difficult connection unit, maintaining on the level H of a high order rather than a through-hole 37 desirably, ( drawing 10 (IV) ).

[0020] On the other hand, if all the ink of a cartridge is consumed and an ink cartridge is removed from the connection unit 1 for exchange of ink, both the connection unit 1, and the slide shafts 11 and 21 and valve elements 55 and 56 of an ink cartridge 57 will lose support, and will close it according to the energization force of springs 14, 24, 53, and 54.

[0021] thereby, the end connection 4 for an atmospheric-air free passage of the connection unit 1 and the end connection 5 for an ink inflow intercept -- having -- the vaporization of the ink solvent from the end connection 4 for an atmospheric-air free passage -- moreover, the outflow of the ink from the end connection 5 for an ink inflow is prevented.

[0022] In addition, in an above-mentioned example, although he is trying to maintain the minimum ink level H of the ink stockroom 2 by the capillary tube force of a narrow part, if the suspension object 60 which has a cross-section round shape is inserted in the upper part of the ink stockroom 2 as shown in drawing 11 (I) thru/or (IV), ink can be held on predetermined level, without being dependent on the capillary tube force of narrow part 2a.

[0023] That is, in the condition that the ink of the specified quantity exists as shown in drawing 11 (I), since the suspension object 60 is located more nearly up than narrow part 2a, it does not check discharge of ink. If it falls to the level H which the oil level of ink should maintain, the suspension object 60 will have descent prevented by narrow part 2a, and will discover the capillary tube force, it will be concerned with reduction of the ink of an ink cartridge 57 like the above-mentioned, and the oil level of the ink of the ink stockroom 2 will be maintained on level H that there is nothing (drawing 11 (II), (III)). And this condition is maintained and the ink of an ink cartridge 57 is supplied to a recording head to the last (drawing 11 (IV)).

[0024] In addition, although the case where the connection unit 1 was directly equipped with an ink cartridge 57 in an above-mentioned example was explained, a liquid level sensor 61 is made to build in the height which should maintain the oil level of the ink stockroom 2 of the connection unit 1, as shown in drawing 12, and the same operation is done so even if it makes it connect with the ink tap hole 65 of the ink storage objects 64, such as an ink bag, with a tube 63 through the liquid-sending pump 62 controlled by the liquid level sensor 61.

[0025] In this case, it is desirable to form the opening 66 for an atmospheric-air free passage in the upper part of the ink stockroom 2, and to close this with the film 67 equipped with water repellence and permeability.

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## DESCRIPTION OF DRAWINGS

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### [Brief Description of the Drawings]

[Drawing 1] It is the perspective view showing one example of the connection unit of this invention.

[Drawing 2] It is the sectional view showing one example of a connection unit same as the above.

[Drawing 3] It is the assembly decomposition perspective view showing one example of a connection unit same as the above.

[Drawing 4] Drawing (a) and (b) are drawings showing the flow of the ink of the negative pressure generating section of a connection unit same as the above, respectively.

[Drawing 5] It is drawing showing the cross-section structure of the negative pressure generating section same as the above, and the flow of ink.

[Drawing 6] It is drawing showing one example of the ink cartridge suitable for a connection unit same as the above.

[Drawing 7] It is drawing showing the condition that the connection unit same as the above was equipped with the ink cartridge, and is \*\*.

[Drawing 8] It is drawing showing the cross-section structure in the condition that the connection unit same as the above was equipped with the ink cartridge.

[Drawing 9] Drawing (a) and (b) are the sectional views expanding and showing the condition of an end connection, respectively.

[Drawing 10] Drawing (I) thru/or drawing (IV) are drawings showing the condition of consumption of the ink of a connection unit same as the above and an ink cartridge, respectively.

[Drawing 11] Drawing (I) thru/or drawing (IV) are drawings showing \*\*\*\*\* of consumption of other examples of a connection unit same as the above of ink, respectively.

[Drawing 12] It is the block diagram showing other examples of application of the connection unit of this invention.

[Description of Notations]

- 1 Connection Unit
- 2 Ink Stockroom
- 2a Narrow part
- 3 Negative Pressure Generating Section
- 4 End Connection for Atmospheric-Air Free Passage
- 5 End Connection for Ink Inflow
- 6 Ink Tap Hole
- 10 20 Valve element
- 11 Slide Shaft
- 12 22 Opening
- 13 23 Packing
- 14, 24, 47, 53, 54 Spring
- 30 Valve Chest
- 31 Film Valve
- 32 Passage Formation Member
- 33 Film
- 34 Heights
- 35 Through Tube
- 36 Filter
- 57 Ink Cartridge
- 60 Suspension Object

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[Translation done.]